MULTI PIECE BEARING FOR TELESCOPING STEERING COLUMN ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The subject invention relates to a vehicle steering column of the kind having jackets of the column engaged one within the other in a telescoping fashion to adjust a height position of a steering wheel connected to the vehicle steering column to accommodate the position of a driver.

2. Description of the Prior Art

[0002] Generally, a variety of tilting and telescoping steering column arrangements have been developed and are used today in the field of automotive industry. A telescoping steering column assembly typically uses two jackets, wherein one jacket is fixed to a frame of a vehicle body, and the other jacket is adapted to be translated with respect to the jacket fixed to the frame, thereby providing relative longitudinal movement between the two jackets with respect to one another. These jackets, engaged one within another in a telescoping fashion, allow the driver to push or pull the steering wheel to a desired position and then to lock the telescoping column. Three fundamental conditions are required by the telescoping adjustment: the telescoping steering column must have a low adjustment force, the jackets must lock securely, and the stiffness of the telescoping steering column must not be degraded.

[0003] Various configurations and designs are available in the prior art for linear guide mechanism for adjusting telescoping steering column assemblies and have been disclosed in United States Patent No's. 3,703,105 to Milton et al., 4,667,530 to Mettler et al., 5,306,032 to Hoblingre et al., 5,086,661 to Hancock, 5,590,565 to Palfenier et al., 5,722,300 to Burkhard et al., 6,354,626 to Cartwright, 6,371,519 to Jurik et al., 6,389,923 to Barton et al., and 6,473,968 to Mastrofrancesco et al. In addition, various configurations and designs for linear guide mechanism for adjusting telescoping steering column assemblies have been disclosed in United Kingdom Patent No. GB 2184213 to Arnold, French Patent No. 2561605 to Haldric, and PCT Patent Application No. WO 02/064989 to Zernickel et al. Several prior art designs include a sleeve bushing disposed between the jackets disposed one within the other in the telescoping fashion

wherein the sleeve bushing travels with the upper jacket when the steering column telescoped inwardly and outwardly in different operational modes.

[0004] There remains a constant need to improve the bearing support of the telescoping jackets in a steering column assembly.

BRIEF SUMMARY OF INVENTION

[0005] A telescoping steering column assembly of the present invention includes an upper jacket having inner and outer surfaces with a hole extending between said surfaces thereof and a lower jacket having inner and outer surfaces with a hole extending between the surfaces thereof. The upper and lower jackets have telescoping ends disposed in overlapping telescoping relationship with one another. A bearing of plastic material is disposed annularly about the outer surface of the lower jacket and engages the inner surface of the upper jacket. The bearing is disposed in a sliding engagement over the hole in one of said jackets and includes a projection extending into the hole in the other of the jackets.

[0006] The present invention includes a method of making a telescoping steering column assembly comprising the steps of disposing a lower jacket having a hole extending between inner and outer surfaces and a telescoping end in telescoping relationship within an upper jacket having a hole extending between inner and outer surfaces and a telescoping end. The next step of the method includes injecting a plastic material between the upper and lower jackets and into the respective holes in the jackets, followed by the step of removing the plastic material from the hole in only one of the jackets.

[0007] An advantage of the present invention is to provide a design for adjusting the relative longitudinal position between two jackets of a steering column that improves bearing strength of the telescoping steering column assembly.

[0008] Another advantage of the present invention is to provide a linear bushing that may be used on any telescoping steering column of the same diameter and with different overlap length.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[00010] Figure 1 is an exploded perspective view of a telescoping steering column assembly of the present invention;

[00011] Figure 2 is a fragmentary cross sectional view of a lower jacket disposed within an upper jacket and sleeves spaced from one the other and disposed annularly about the lower jacket and engaging the upper jacket, wherein each sleeve defines an annular cavity open to the jackets;

[00012] Figure 3 is a fragmentary another cross sectional view of the lower jacket disposed within the upper jackets, shown in Figure 2, having bearings disposed in the annular cavity of each sleeve;

[00013] Figure 4 is a cross sectional view taken along line 4-4 of Figure 3;

[00014] Figure 5 is a cross sectional view taken along line 5-5 of Figure 3;

[00015] Figures 6 shows a step of disposing the lower jacket in a telescoping relationship within the upper jacket of a method of the present invention;

[00016] Figure 7 shows a step of disposing the sleeves annularly about the lower jacket and within the upper jacket;

[00017] Figure 8 shows a step of inserting a bar into the lower jacket to prevent a plastic material from penetrating into the lower jacket;

[00018] Figure 9 shows a step of injecting the plastic material through the jackets and sleeved disposed therebetween to form bearings disposed within the sleeves, respectively;

[00019] Figure 10 shows a step of removing the plastic material from holes of the upper jacket; and

[00020] Figure 11 shows a step of removing the plastic material from holes of the lower jacket.

DETAILED DESCRIPTION OF THE INVENTION

[00021] Referring to the Figures wherein like numerals indicate like or corresponding parts throughout the several views, a telescoping steering column assembly of the present invention is generally shown at **10.**

[00022] The telescoping steering column assembly **10** includes an upper jacket, generally indicated at **12**, having inner **14** and outer **16** surfaces with a hole **18** extending between the surfaces **14**, **16** thereof and a lower jacket, generally indicated at

20, having inner **22** and outer **24** surfaces with a hole **26** extending between the surfaces **22**, **24** thereof. The upper **12** and lower **20** jackets have telescoping ends **28**, **30**, **32**, **34**, respectively, disposed in overlapping telescoping relationship with one another. A bearing **36** of plastic material **P** of the assembly **10** is disposed annularly about the outer surface **24** of the lower jacket **20** and the inner surface **14** of the upper jacket **12**. The bearing **36** is disposed in a sliding engagement over the hole **18** in one of the jackets **12** and includes a projection **38** extending into the hole **26** in the other of the jackets **20**.

[00023] Referring to Figures 2 and 3, the telescoping steering column assembly **10** includes a sleeve **40** disposed annularly about the lower jacket **20** and within the upper jacket **12**. The sleeve **40** includes terminal ends **42**, **44** and an annular cavity **46** defined therewithin. The sleeve **40** includes a plurality of spokes **47** extending within the cavity **46** and interconnecting the terminal ends **42**, **44**. The spokes **47** are spaced one from the other annularly about the lower jacket **20** for the flow of the plastic material **P** throughout the annular cavity **46**. The annular cavity **46** is open to the upper **12** and lower **20** jackets. The annular cavity **46** is designed to hold the bearing **36** therewithin having the projection **38** extending radially from the cavity **46**. The sleeve **40** includes a lip **48** extending from one of the terminal ends **42** of the sleeve **40** to abut and engage the telescoping end **34** of the lower jacket **20**. The bearing **36** is disposed in a sliding engagement over the hole **18** in the upper jacket **12** wherein the projection **38** extends into the hole **26** in the lower jacket **20**.

[00024] Referring back to Figures 2 and 3, the telescoping steering column assembly **10** includes a second sleeve **50** disposed annularly about the lower jacket **20** and within the upper jacket **12**. The second sleeve **50** is spaced from the first mention sleeve **40**. Similar to the first mentions sleeve **40**, the second sleeve **50** includes terminal ends **52**, **54** and a second annular cavity **56** defined therewithin. The sleeve **50** includes a plurality of spokes **57** extending within the cavity **56** and interconnecting the terminal ends **52**, **54**. The spokes **57** are spaced one from the other annularly about the lower jacket **20** for the flow of the plastic material **P** throughout the annular cavity **56**. The second annular cavity **56** of the second sleeve **50** is open to the upper **12** and lower **20** jackets. The second annular cavity **56** is designed to hold a second bearing **60** of plastic material spaced from the first mentioned bearing **36**. The second sleeve **50** includes a lip **58** extending from one of the terminal ends **54** of the second sleeve **50** to abut and engage the telescoping end **28** of the upper jacket **12**. The second bearing **60** includes a second projection **62** extending radially from the cavity **56** of the second

sleeve **50** into a second hole **64** defined within the upper jacket **12**. The second bearing **60** is disposed in a sliding engagement over a second hole **66** defined within the lower jacket **20** wherein the remaining second projection **62** extends into the second hole **64** in the upper jacket **12**.

[00025] Referring back to Figure 1, the telescoping steering column assembly **10** includes a lower mounting mechanism, generally indicated at **70**, for connecting the lower jacket **20** to a vehicle body (not shown). The lower mounting mechanism **70** includes a lower bracket **72** of a generally rectangular configuration having an aperture **74** defined therewithin to engage one of the telescoping ends **34** of the lower jacket **20**. The telescoping steering column assembly **10** also includes an upper mounting mechanism, generally indicated at **76**, for connecting the upper jacket **12** to the vehicle body and to slidably support the upper jacket **12** for telescoping movement relative to the lower jacket **20** between various positions.

[00026] The upper mounting mechanism **76** includes an upper bracket **78** having first **80** and second **82** ends, a bottom **84**, and sides **86**, **88** extending upwardly from the bottom **84** to define a gap **90** therebetween. The upper bracket **78** includes a slot **92** defined within each of the sides **86**, **88** at the first end **80**.

[00027] The telescoping steering column assembly **10** includes a compression bracket **94** having a bottom **96** and side walls **98, 100** and first **102** and second **104** ends and an inlet **106** defined within the side walls **98, 100** and extending between the first **102** and second **104** ends of the compression bracket **94** perpendicularly to the slots **92** of the upper bracket **78.** The compression bracket **94** is slidably disposed within the upper bracket **78.** The telescoping steering column assembly **10** includes a release lever **110** having a shoulder **112** at one terminal end and a plate **114** at another terminal end. The shoulder **112** includes an inner surface **116** and a rod **118** extending outwardly therefrom to a distal end **120** having a male thread **122.** In operation, the release lever **110,** pushed upwardly or downwardly in different mode of operation controls the movement of the compression bracket **94** within the upper bracket **78**. The telescoping steering column assembly **10** includes a shaft **124** extending linearly and transversely through the upper **12** and lower **20** jackets.

[00028] The present invention includes a method of making the telescoping steering column assembly **10** shown in Figures 6 through 11. The method begins with disposing the lower jacket **20** having at least one hole **26** extending between the inner **22** and the outer **24** surfaces and the telescoping ends **32, 34** in telescoping

relationship within the upper jacket **12** having at least one hole **18** extending between the inner **14** and outer **16** surfaces and the telescoping ends **28**, **30**, as shown in Figures 6 and 7. As best shown in Figures 7 and 8, the next step of the method includes defining the cavity **46** extending annularly about the lower jacket **20** and within the upper jacket **12** by disposing the sleeve **40** having the terminal ends **42**, **44** and the lip **48** extending from one of the terminal ends **42**. The following step of the method includes defining the second cavity **56** extending annularly about the lower jacket **20** and within the upper jacket **12** by disposing the second sleeve **50** having the terminal ends **52**, **54** and the lip **58** extending from one of the terminal ends **54** of the sleeve **50**.

[00029] Referring back to Figure 8, the method includes the step of blocking the inner surface **22** of the lower jacket **20** from the plastic material **P** by inserting a bar **126** into the lower jacket **20**. The next step include injection of the plastic material **P** to form the bearing **36** disposed within the annular cavity **46** of the sleeve **40**, wherein the bearing **36** is formed with the integral projection **38** extending radially from the annular cavity **46** to one of the holes **26** in the lower jacket **20**, as shown in Figure 9. The forming of the bearing **36** is followed by the step of injecting the plastic material **P** to form the second bearing **60** disposed within the annular cavity **56** of the second sleeve **50**, wherein the second bearing **60** is formed with the second projection **62** extending radially from the annular cavity **56** to one of the holes **64** in the upper jacket, also shown in Figure 9.

[00030] After the plastic material **P** has been injected, the method includes the step of removing the plastic material **P** from the hole **18** in the upper jacket **12** by a drill **128** to provide the sliding engagement of the bearing **36** over the hole **18** in the upper jacket **12** whereby the remaining projection **38** extends into the hole **26** in the lower jacket **20**, as shown in Figure 10. The method further includes the step of removing the plastic material **P** from the second hole **66** in the lower jacket **20** by the drill **128** to provide the sliding engagement of the second bearing **60** over the second hole **66** in the lower jacket **20** whereby the remaining second projection **62** extends into the second hole **64** defined within the upper jacket **12**, as shown in Figure 11.

[00031] Obviously, many modifications and variations of the present invention are possible in light of the above teachings. The invention may be practiced otherwise than as specifically described within the scope of the appended claims. These antecedent recitations should be interpreted to cover any combination in which the incentive novelty exercises its utility.